Appl. No.: 10/709,681
Amdt. Dated: 9/10/2006
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AMENDMENTS TO THE DRAWINGS:

There are no amendments to the drawings presented herewith.

REMARKS/ARGUMENTS

In the specification, paragraphs [0014], [0015], [0023], and [0025] have been amended to correct minor editorial problems.

Claims 1 – 8 remain in this application. Claims 1 – 8 have been amended to correct minor editorial problems.

No new matter has been introduced by these amendments.

Claims 1 – 3 and 5 – 6 were rejected under 35 U.S.C. 102(b) as being anticipated by Dougherty et al. (US 6,222,341). Specifically, the Examiner states:

> Regarding Claim 1, Dougherty discloses in Figures 1 – 4, automobile management system using two batteries comprising a primary battery (20) designed to power a primary service network (Column 2, lines 57 – 59) connected to one of its terminals (17), to which a generator (24) is also connected, a second battery (14) designed to power a secondary network (a starter network, element 18) essentially assigned to start-up functions and a switch (302, 402 and 418) managed by a control unit or module (30) which, depending on the status of the charges of both batteries (20) and (14) and the charge demands of the mentioned networks (1) and (3), enables current flow between the two networks (12) and (10) in any direction (, its characterized by the use of a unidirectional current flow device (elements 310 – 314 and 410 – 414) the he aforementioned switch (302, 402, 418) located between the two networks (12) and (10) and respectively powered by the mentioned batteries (20) and (14), whose device (310 – 314 and 410 – 414) provides current flow towards the start-up battery (14) smaller than the current flow through the BCO2 (302, 402, 418) switch, when it is closed, and also smaller than the current from generator (24) to battery (20) (noted that battery 20 is connected at node 17 and the diodes 310 – 314 and 410 – 414 are allowed current flow to the battery 14, Column 1, lines 39 – 67, Column 3, lines 45 – 47).
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> Regarding Claim 2, Dougherty discloses in Figures 1 – 4, characterized because said control unit (30) includes means to detect the condition status of both batteries (Column 4, lines 9 – 20)

Regarding Claim 3, Dougherty discloses in Figures 1 – 4, characterized because said unidirectional flow device (310 – 314 and 410 – 414) connected between the two networks (10) and (12) is a power barrier diode (noted that the diodes are preventing a flow of current from battery 14 to 20).

Regarding Claim 5, Dougherty discloses in Figures 1 – 4, Characterized because the mentioned controllable switch that connects the battery (20) and the network (10) with the battery (14) and network (12) is a switch (302, 418, 402) with BCO (Battery Cut Off) disconnection functions from the battery (20).

Regarding Claim 6, Dougherty et. al. disclose in Figures 1 – 5, management methods of a car with two batteries, which comprises a first battery (20) designed to power a first device network connected to one of its terminals, to which a generator (24) is also connected, a second battery (14) designed to power a second network essentially assigned to start-up functions and a Bco2 switch (302, 402) managed by a control unit (30) or module which depending on the status of the charges of both batteries (20) and (14) and the charge demands C1 and C2 of the mentioned networks and enables current to flow between the tow networks (Column 3, lines 3 – 15, Column 4, lines 10 – 15) in any direction characterized by a) performing a permanent monitoring of the SOC of batteries (20) and (14) (measuring the voltage levels of the batteries, Columnn3, lines 3 – 15, Column 4, lines 10 – 15) and the charge demands of C1 and C2 and provide an actuation on the mentioned switch BCO2, allowing the connection of one of both batteries (20) and (14) to both the networks and with energy transfer between them (Energy is transferred from one network to the other when battery 20 is providing charging current to battery 14) and b) providing permanent unidirectional current flow network containing battery B1 to network (2)(Noted that Figures 3 and 4 indicate that the diodes 310 – 314 or 410 – 414 provides a permanent connection between the two batteries network, the diodes are designed to prevent only reverse current flow) which includes battery 14 with a current flow smaller than the one circulating through the mentioned switch (302; or 402),

> when it is close, and also smaller than the feeding current to battery from generator.
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> Regarding Claim 7, Dougherty discloses in Figures 1 – 4, characterized because the monitoring of the charge status SOC of the a) stage, is complemented with the monitoring of the condition status of the battery (Column 4, lines 9 – 20)
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> Regarding Claim 8, Dougherty discloses in Figures 1 – 4, characterized because said b) stage for providing a permanent unidirectional current flow from network (10) to network (12) is made across a unidirectional current flow device (310 – 314 and 410 – 414) such as a power diode.

Applicant respectfully traverses this rejection. The key to Applicants' invention is the use of a unidirectional current flow device that establishes a bridge or permanent connection between two networks, a primary service network, and a secondary start-up network where these corresponding separate batteries and networks are connected through a control module to ensure the flow of electrical energy between these two batteries and the associated two networks in both directions as necessary. This unidirectional current flow device ensuring that the current flow through it is smaller than the current flowing through the control module as well as being smaller than the current flowing from the generator feeding the first battery ensures the constant feeding to the start-up network and therefore permanent recharging of the start-up battery preventing said start-up battery from being discharged. Additionally, Applicant's claimed invention provides that where a power barrier diode is used to establish a permanent connection between the two networks, the permanent recharging of the start-up battery is ensured.

A fair reading of the Dougherty et al. (US 6,222,341) reference discloses a single electrical network having a primary start-up battery and a secondary reserve battery where the two batteries in the single electrical network are coupled together (see for example, Col. 2, lines 39 – 52 and Fig. 1). In addition, the two batteries are connected directly and independently to the alternator and the alternator is controlled by an engine controller (see for example, Col. 2, line 53 – Col. 3, line2). However, the only current direction between the two batteries under any condition is from the reserve battery to the start-up battery (see for example, Col. 3, lines 39 – 50, and Fig. 2), including a constant current flow to ensure that the start-up battery does not discharge during periods of non-use (see for example, Col. 3, lines 3 – 16). In order for the reserve battery to provide

current upon demand need from the start-up battery a charge maintenance device incorporating pulse generator cooperatively connected to a plurality of NAND gates, etc. (see for example, Col. 3, lines 16 – 26, and Fig. 2) non of which is required by Applicant's claimed invention. Further disclosed is that the reserve battery is charged when its charge level drops below a pre-determined charge level using a SOC sensor but the sensor is not used to determine when to terminate the charge cycle, instead the charge cycle is pre-set by a timer and turned off at the end of a pre-determined time period has elapsed (see for example, Col. 3, line 50 – Col. 4, line 4, and Fig. 2) and (Col. 4, lines 5 – 20, Col 5., lines 48 – 61, and Fig. 2). There is no sensor or system to prevent the start-up battery from discharging into the reserve battery so the reserve battery must have a higher voltage rating that the start-up battery to prevent this (see for example, Col. 4, lines 21 – 34, and Fig. 3). The diodes taught in this reference are only used to stop the start-up battery from discharging during periods when the vehicle engine is not running (see for example, Col. 4, lines 36 – 43, and Fig. 3) and the relay to couple both batteries to the starter motor is only used to allow both batteries to provide current to the starter motor when it is needed to start the vehicle (see for example, Col. 4, lines 44 – 56, and Fig. 3). Because the reserve battery must have a higher voltage level than the start-up battery in this reference there is taught a method of using multiple lower voltage level start-up batteries or multiple section start-up batteries where each electrically separate section has a lower voltage level than the reserve battery such that the reserve battery does not have to be of extreme voltage level and/or size (see for example, Col. 5, lines 9 – 28).

Thus the Dougherty et al. (US 6,222,341) reference fails to disclose, teach, or fairly suggest how to provide a dual electrical network system each network having a battery associated therewith and in which the current can be directed to either battery from the other network and other battery as well as provide for the constant and continual sensing of the start-up battery to ensure it is always at a charge level that allows it to start the vehicle by turning over the starter motor. Instead it teaches that in a single electrical network system having a start-up battery and a reserve battery the current can only flowing one direction from the reserve battery to the start-up battery and that the sensor circuits are only used to turn on the reserve battery charging cycle and a timer is required to turn off the recharge cycle after a predetermined time period has elapsed without regard to a sensed SOC of said reserve battery. In addition, because this reference

requires that the reserve battery have a higher voltage level than the start-up battery it will not work in a duel voltage system unless the start-up battery which is typically a 36V battery is smaller than the reserve battery meaning that the reserve battery can not be suitable for a second network of a 14V system, unless the start-up battery is a series of batteries each having a voltage level of less than 14V.

Clearly, when viewed in this light the Dougherty et al. (US 6,222,341) reference does not disclose, teach, or fairly suggest the dual electrical network, dual battery, dual current flow direction, constantly sensed system of Applicants' present invention.

Claim 4 was rejected under 35 U.S.C. 103(a) as being unpatentable over Dougherty et. al. (US 6,222,341) in view of Morgan (US 2003/00038611) and Holloway et. al. (US 5,504,416). Specifically, the Examiner states:

> Regarding Claim 4, Dourthy discloses in Figures 3 and 4, characterized because the control module (30) controlling the connection/disconnection of the mentioned switch, includes a microcontroller. Dourthy does not disclose explicitly, a condition status sensor and a charge status sensor. Morgan discloses in paragraph 014, a charge status sensor. Holloway et. al. disclose in Figure 3A, element 14 and Column 7, lines 19 – 20, a condition status sensor. It would have been obvious to the person ordinary skill in the art at the time of the invention to add a charge status sensor in Dougherty System as taught by Morgan in order to control the battery charging level and prevent overcharging and over discharging. Further, it would have been obvious to the person ordinary skill in the art at the time of the invention to add a condition status sensor in Dougherty System as taught by Holloway et. al. in order to avoid battery damage caused by overcharging or depletion.

Applicant respectfully traverses this rejection. The key to Applicants' invention, as mentioned above, is the use of a unidirectional current flow device that establishes a bridge or permanent connection between two networks, a primary service network, and a secondary start-up network and their corresponding separate batteries these batteries and networks connected through a control module to ensure the flow of electrical energy between these two batteries and the associated two networks. This unidirectional current flow being smaller than the current flowing through the control module as well as being smaller than the current flowing from the generator feeding the first battery ensures the

constant feeding to the start-up network and therefore permanent recharging of the start-up battery preventing said start-up battery from being discharged. Additionally, Applicant's claimed invention provides that where a power barrier diode is used to establish a permanent connection between the two networks, the permanent recharging of the start-up battery is ensured.

A fair reading of the Dougherty et al. (US 6,222,341) reference, as mentioned above, discloses a single electrical network having a primary start-up battery and a secondary reserve battery where the two batteries in the single electrical network are coupled together (see for example, Col. 2, lines 39 – 52 and Fig. 1). In addition, the two batteries are connected directly and independently to the alternator and the alternator is controlled by an engine controller (see for example, Col. 2, line 53 – Col. 3, line2). However, the only current direction between the two batteries under any condition is from the reserve battery to the start-up battery (see for example, Col. 3, lines 39 – 50, and Fig. 2), including a constant current flow to ensure that the start-up battery does not discharge during periods of non-use (see for example, Col. 3, lines 3 – 16). In order for the reserve battery to provide current upon demand need from the start-up battery a charge maintenance device incorporating pulse generator cooperatively connected to a plurality of NAND gates, etc. (see for example, Col. 3, lines 16 – 26, and Fig. 2) non of which is required by Applicant's claimed invention. Further disclosed is that the reserve battery is charged when its charge level drops below a pre-determined charge level using a SOC sensor but the sensor is not used to determine when to terminate the charge cycle, instead the charge cycle is pre-set by a timer and turned off at the end of a pre-determined time period has elapsed (see for example, Col. 3, line 50 – Col. 4, line 4, and Fig. 2) and (Col. 4, lines 5 – 20, Col 5., lines 48 – 61, and Fig. 2). There is no sensor or system to prevent the start-up battery from discharging into the reserve battery so the reserve battery must have a higher voltage rating that the start-up battery to prevent this (see for example, Col. 4, lines 21 – 34, and Fig. 3). The diodes taught in this reference are only used to stop the start-up battery from discharging during periods when the vehicle engine is not running (see for example, Col. 4, lines 36 – 43, and Fig. 3) and the relay to couple both batteries to the starter motor is only used to allow both batteries to provide current to the starter motor when it is needed to start the vehicle (see for example, Col. 4, lines 44 – 56, and Fig. 3). Because the reserve battery must have a higher voltage level than the

start-up battery in this reference there is taught a method of using multiple lower voltage level start-up batteries or multiple section start-up batteries where each electrically separate section has a lower voltage level than the reserve battery such that the reserve battery does not have to be of extreme voltage level and/or size (see for example, Col. 5, lines 9 – 28).

Thus the Dougherty et al. (US 6,222,341) reference, as mentioned above, fails to disclose, teach, or fairly suggest how to provide a dual electrical network system each network having a battery associated therewith and in which the current can be directed to either battery from the other network and other battery as well as provide for the constant and continual sensing of the start-up battery to ensure it is always at a charge level that allows it to start the vehicle by turning over the starter motor. Instead it teaches that in a single electrical network system having a start-up battery and a reserve battery the current can only flowing one direction from the reserve battery to the start-up battery and that the sensor circuits are only used to turn on the reserve battery charging cycle and a timer is required to turn off the recharge cycle after a predetermined time period has elapsed without regard to a sensed SOC of said reserve battery. In addition, because this reference requires that the reserve battery have a higher voltage level than the start-up battery it will not work in a duel voltage system unless the start-up battery which is typically a 36V battery is smaller than the reserve battery meaning that the reserve battery can not be suitable for a second network of a 14V system, unless the start-up battery is a series of batteries each having a voltage level of less than 14V.

A fair reading of the Morgan (US 2003/0038611 A1) reference discloses rechargeable Ni – MH battery of the type used to power electronic devices. A type of battery totally unsuited to start a vehicle by turning over a starter motor or of being charged by a vehicle alternator/generator (see for example, paragraph [0004]). The particular Ni – MH battery design disclosed is of multiple cell batteries designed to discharge in parallel but to recharge independently (see for example, paragraphs [0007] and [0008]). In this reference the disclosed switch is used to return individual cells to its parallel discharging grid (see for example, paragraph [0009]). The SOC sensor is used to monitor individual cells in battery, not the condition of separate batteries to allow one battery to recharge another battery (see for example, paragraph [0015]). Thus, a Ni – MH battery with, as taught in the examples of this reference, 16 groups of 10 cells each are

electrically joined into a single battery pack unit to discharge in parallel in groups but to recharge individual cells as determined by the SOC sensor.

The Morgan (US 2003/0038611 A1) reference teaches a how to be able to discharge groups of individual cells in parallel as a unit but to recharge individual cells so as not to inhibit the discharging and recharging of any other cell in the group and in the battery pack. It does not teach how to use one battery of one voltage level to recharge, or prevent discharge, or assist in starter motor operation of a second battery. Thus, there is absolutely nothing within the Morgan reference to provide the required impetus to direct one skilled in the art to combine this reference with any reference of lead/acid batteries for starting a vehicle to take a portion of this reference and somehow combine it with the Dougherty et al. reference without first having read Applicant's claimed invention. In addition, even if these references were combinable, which they are not, they do not disclose, teach or fairly suggest the claimed invention of a dual electrical network, dual battery system capable of charging either battery from the other.

A fair reading of the Holloway et al. (US 5,504,416) reference discloses a battery charger which can be used to recharge rechargeable batteries or battery packs where temperature rise due to the recharging operation can be seriously detrimental to the ability to charge the battery or to charge it fully (see for example, Col. 1, lines 13 – 48). The invention provides a solution by providing a three-stage recharging cycle utilizing continuous current adjustment to optimize the battery charge (see for example, Col 1, line 59 – Col. 2, line 22). This three-stage charging sequence is determined by a model based on charge acceptance, battery temperature and cumulative supplied charge where the model uses six states (see for example Col. 2, lines 23 – 44). Because in the type of battery packs being charged temperature is such a critical parameter there are sensors to control the charge rate based on the temperature of the battery pack being charged as it rises over the charging period (see for example, Col. 3, lines 43 -- 64, and Fig. 1). Also, because of the criticality of the temperature rise to recharging Ni – MH batteries contemplated by this reference, there is a critical requirement of a three-stage recharging cycle (see for example, Col. 3, line 65 to Col. 4, line 23). In addition, this reference teaches that the charging is accomplished by using primary and secondary coils controlled by a sensor system not directly from one battery to another (see for example,

Col. 4, line 39 – Col. 5, line 8, and Fig. 2). Thus, this reference teaches that to charge a Ni – MH battery pack you must have 1) a voltage comparator (see for example, Col 5, lines 39 – 50); 2) a temperature sensor (see for example, Col. 5, line 51 – Col. 6, line 7); and 3) a voltage of the battery rising or falling sensor (see for example, Col. 6, lines 27 – 33). Thus, the disclosed device requires the sensing of two voltages and the battery pack temperature to work (see for example, Col. 7, line 31 – Col. 8, line 19, and Fig. 3A). Finally, this reference teaches that the batteries to be charged must have the recharging cycle manually started or provide a battery detection system in the charger (see for example, Col. 6, lines 34 – 52).

The Holloway et al. (US 5,504,416) reference teaches that to charge Ni – MH battery packs efficiently you must use a three-stage recharging cycle that is controlled by a computer model which monitors and responses to the battery temperature and at least two different battery voltage reading. This does not teach how to utilize a dual electrical system with a battery in each network to charge either battery from the other and to provide the constant maintenance of voltage level in one of the two batteries that is used to operate a starter motor. In fact, it is not even combinable with the Morgan reference which teaches another Ni – MH battery charging device let alone a dual lead/acid battery/dual electrical network system to allow each battery to charge the other as necessary. Thus, there is absolutely nothing within the Holloway et al. reference to provide the required impetus to direct one skilled in the art to combine this reference with any reference of lead/acid batteries for starting a vehicle to take a portion of this reference and somehow combine it with the Dougherty et al. reference, or the Morgan reference without first having read Applicant's claimed invention. In addition, even if these references were combinable, which they are not, they do not disclose, teach or fairly suggest the claimed invention of a dual electrical network, dual battery system capable of charging either battery from the other.

Clearly, when viewed in this light the Dougherty et al. (US 6,222,341) reference, the Morgan (US 2003/0038611 A1) reference, the Holloway et al. (US 5,504,416) reference, nor any combination thereof, discloses, teaches, or fairly suggests the dual electrical network, dual battery, dual current flow direction, constantly sensed system of Applicants' present invention.

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Applicants acknowledge the prior art made of record as pertinent, but not relied upon as a basis of rejection by the Examiner. Applicants make no further comment regarding this prior art.

In view of the remarks herein, and the amendments hereto, it is submitted that this application is in condition for allowance, and such action and issuance of a timely Notice of Allowance is respectfully solicited.

Respectfully submitted,

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